CRUISE REPORT

ORV SAGAR KANYA

Cruise No. 129

(28 November to 22 December, 1997)

राष्ट्रीय समुद्र विज्ञान संस्थान

NATIONAL INSTITUTE OF OCEANOGRAPHY

ORV SAGAR KANYA

Cruise No. 129

(28 November to 22 December, 1997)

NATIONAL INSTITUTE OF OCEANOGRAPHY

(Council of Scientific and Industrial Research)

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REPORT ON THE 129TH OCEANOGRAPHIC CRUISE OF O.R.V. *SAGAR KANYA*

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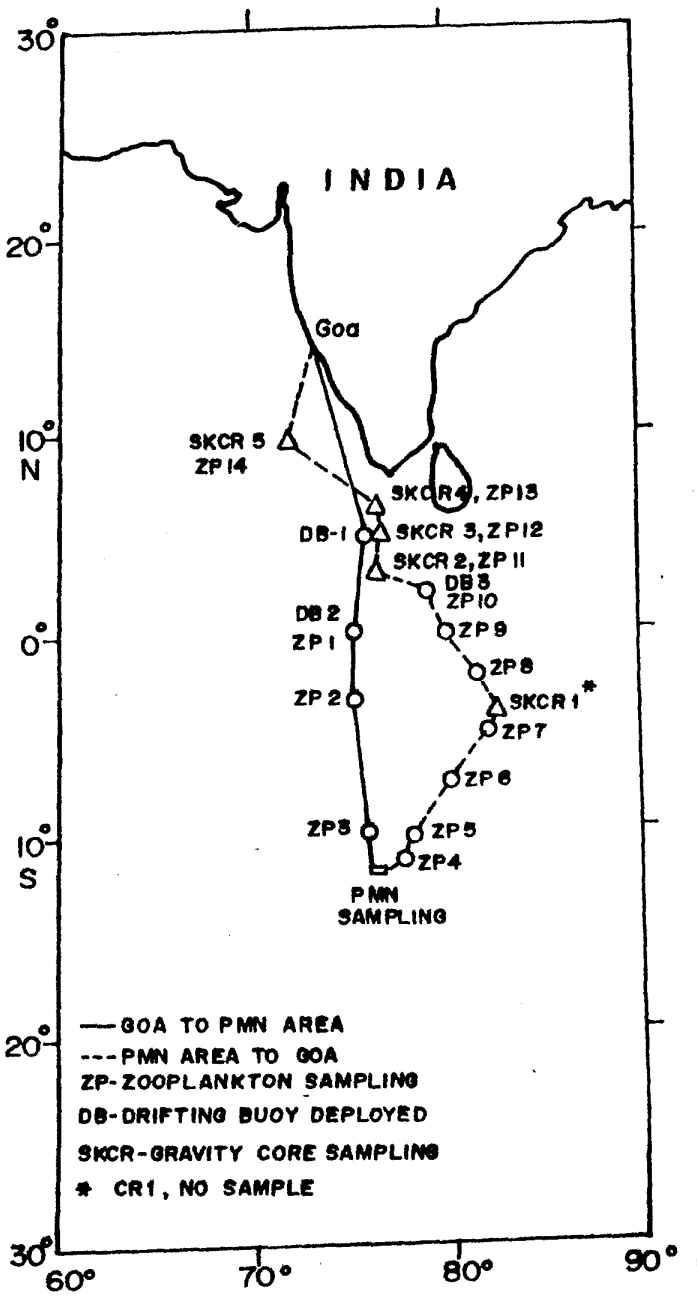

Figure 1. ORV Sagar Kanya Cruise-129, track and sampling stations.

2. SUMMARY

The cruise 129 of ORV *Sagar Kanya* was undertaken in the central Indian Ocean Basin for the project "Polymetallic Nodule Survey and Exploration". The main objective of the cruise was to obtain manganese nodule abundance data at 40 stations at 5 km interval identified by the Dept. of Ocean Development in three blocks (Nos. 57, 63 & 64). In addition to this, deployment of three drifting buoys at pre-determined locations, zooplankton sampling, sediment and cobalt rich Mn-crust sampling in the vicinity of Afanasiy-Nikitin seamount and on-board training for Marine Science students of Goa University were also planned.

Only six stations were completed for PMN sampling due to damage to the wire rope. Four sediment cores of length varying between 5.2 m and 5.8 m were collected. Mn-crust sampling in the vicinity of the seamount could not be done due to heavy weather, unfavourable depth conditions and limitations in the usable rope. Three drifting buoys were deployed at the pre-determined locations and were reported to be working satisfactorily.

The cruise started from Mormugao harbour on 28 Nov. 97 and ended in the same harbour on 22 Dec. 97.

3. PARTICIPANTS

3.1 Scientific component

V.K .Banakar (Chief Scientist)	NIO, Goa
J.N. Pattan	
B. Vijayakumar	
V. Khedekar	
G. Chandwale	
S. Terdalkar	Goa University
S. Jaishankar	
A. Volvaikar	
S. Parsekar	
M.H.M. Joao	
U. Chinchkar	
S. Naik	
N. Purushan	
P. Bhupati	M/s NORINCO
P. Rodrigues	
J.P. Joseph	
K.G. Gogi	

3.2 Ship's complement

Capt.N. Srikumar	— Master
S.P. Sahoo	— Chief Officer
T. Singh	— 3rd Officer
Kanakaraj	— AWKO
A. Kumar	— AWKO
J. Jose	— Medical Officer
Nagarcenkar	— Rad. Officer
A. Home	— Chief Engineer
G. Ganguli	— 2nd Engineer
H.K. Jain	— 3rd Engineer
R.K .Mitra	— 3rd Engineer
P. Sridharan	— Elec. Officer
M. Chahal	— Elec. Officer
G. Jaques	— Purser
I. Vaz	— Catering Officer
N. Moorthy	— Serang

4. INTRODUCTION

This is the 129th cruise of ORV *Sagar Kanya* and was undertaken for the Project Polymetallic Nodule Survey & Exploration. The main objective of the expedition was to obtain manganese nodule abundance data at 40 stations at 5 km interval identified by the Dept. of Ocean Development in three blocks (No.57,63,and 64) in the Central Indian Ocean Basin. It was specified to use the Van-Veen Grab or Spade Corer for the purpose of sampling.

In addition to the main objective, there were four other assigned tasks:

a) Deployment of three drifting buoys at predetermined locations in the Equatorial Indian Ocean, (Locations were given by Physical Oceanogr. Div. scientists).

b) Zooplankton sampling for a Ph.D. Dissertation student of Goa University

c) Sediment and cobalt rich Mn-crust sampling in the vicinity of Afanasiy-Nikitin seamount.

d) Onboard training for the first year marine science students of the Goa University.

The main target area for PMN sampling is located in the Indian Mine Site in the Central Indian Basin around 12°S lat. and 76°E long. The zooplankton sampling was planned along the cruise track. The cruise track and the sampling locations are shown in Figure-1.

5. CRUISE DETAILS

5.1 Manganese Nodule sampling

The vessel reached the nodule sampling area on 6 December. The plot of stations provided by the DOD is given in Figure 2. It was decided to operate Van-Veen Grab for sampling. After successful completion of three stations, the grab came open continuously in two operations and hence it was decided to switch over to spade corer. A Benthos deep-sea pinger was used during all the operations. Excellent pinger records were helpful to track the equipment precisely and to obtain the exact position of the sample. Using the position of the sample collected and the given position of a station, the difference was obtained as offset in km due to drift of the vessel. It was observed that there is nearly 3-4 km offset from the given location. Thus the validity of 5 km sampling appears to be impractical. Table-1 provides the details of the position and the actual sample location as obtained on the vessel using GPS.

Only six stations were completed in the PMN area. When the Station SPC-03 (sixth station) was under progress, the wire rope developed a serious problem at a length of 5200 m. A strand came out and the rope got jammed in the sleeves of the storage winch. This problem developed when the hauling of the equipment was in progress and nearly 200 m separation between equipment and seafloor was recorded. The strand came out between the deep-sea winch and storage winch. In the initial stage it appeared very difficult to retrieve the hanging 5 km rope, spade corer, sample and the pinger because the damage was very serious. However, after 12 hours of struggle the entire wire rope, equipments and intact sample were retrieved. Upon careful inspection, it was revealed that only 4000 m long wire rope is useful for any further operations, thus it was not possible to continue PMN sampling because all the PMN stations were at 5200 m water depth. Subsequently we were informed to proceed to sediment sampling around Afanasiy-Nikitin seamount and shallow depth sampling. Due to heavy weather, unfavourable depth conditions and limitations in the usable rope it was not possible to sample in the vicinity of the seamount. Therefore, it was planned to set return voyage alongwith

continuation of zooplankton sampling and some shallow depth coring (<4000 m) operations.

5.2 Sediment Coring

Four top intact sediment cores of length varying between 5.2 m and 5.8 m were collected. All the cores were subsampled at 2 cm interval for high resolution studies. The coring operations were precisely monitored by the help of pinger records. Table 2 provides the details of coring stations. A good lithologic variation could be noticed in SKCR 02 and SKCR-03, while the texture appears to be monotonous in the remaining two cores (SKCR-04 and 05). The sediment samples were obtained from the depth zone covering CCD and lysocline in the north Equatorial Indian Ocean.

5.3 Drifting buoy deployment

Three drifting buoys were deployed at the locations provided by the POD scientists without substantially changing the cruise track. All the buoys were reported to be working satisfactorily as per the confirmation received from the head quarters.

DB-1 (11091): 5° 00' N; 76° 17'E : SST 29.5°C

DB-2 (11090): 0° 00' ; 75° 08'E : SST 29.8°C

DB-3 (11088): 2° 00' N; 79° 00'E : SST 29.0°C

5.4 Zooplankton sampling

In all 14 zooplankton sampling stations were completed. These samples were collected for Ph.D. dissertation of a Goa University student. A Bongo net (Length 2.5 m, Mouth area 0.6 sq. m, mesh 300) was used to collect the zooplanktons. A precalibrated flow meter was attached at the centre of the frame to determine the volume of water filtered through and filtering efficiency of the net. A vertical haul of 200 m to the surface was done for quantitative sampling. Also at each station the net was towed at the subsurface level for 15 minutes to determine the zooplankton community. The results of the preliminary investigation is given in Table-3. These observations are of preliminary nature and need to be varified during detailed laboratory investigation.

5.5 Training of marine science students

In the intial stage of the cruise a series of seminars related to oceanographic processes was arranged for exchange of knowledge and to benefit the students. The students were made to associate with almost all operations for obtaining first hand experience in onboard work. The following list of activities gives an idea about the training provided to the students:

1. Reading the positions from navigation charts and plotting the positions.
2. Visit to all laboratories and introduction of various analytical, survey and sampling equipments.
3. Visit to various parts of the vessel and introduction by ship officers/engineers.
4. Operating deep-sea winch and sampling equipments.
5. Subsampling the sediment cores, describing manganese nodule textures etc.
6. Zooplankton sampling and identification of some prominent species.
7. Measuring the seafloor depth from echosounder and interpreting the pinger records.
8. Microscopic observations of carbonate ooze samples and identifying forams and other components.

In general, the students expressed their complete satisfaction about the training and accordingly submitted a report to DOD through the Director, ASC, Vasco.

6. RECOMMENDATIONS

Regular maintenance of winch wire is a must for smooth completion of the given tasks. In particular, every three months the wire rope needs to be lowered to full length while sailing and thorough washing with fresh water and greasing. This should be followed as a ritual to maintain the quality and strength of wire rope. The present wire rope is unfit to use at deep-sea stations having water depth more than 3800 m. The DOD should think about the practicability of 5 km sampling strategy, since maintaining the vessel at given location appears to be impossible due to drift. Even during normal weather conditions the vessel has recorded a drift of more than 3 km within operation time of one station thus making the 5 km sampling scientifically invalid.

7. ACKNOWLEDGEMENTS

The Chief Scientist and other participants gratefully acknowledge the co-operation of ship officers and crew throughout the cruising. The positive response of Master, Ch. Engineer and Ch. Officer to retrieve (almost lost) equipments and wire is highly appreciated. I also thank all the participants for maintaining scientific temper intact throughout the cruise. M/s NORINCO engineers' help during all the operations, apart from their maintenance routine, is acknowledged.

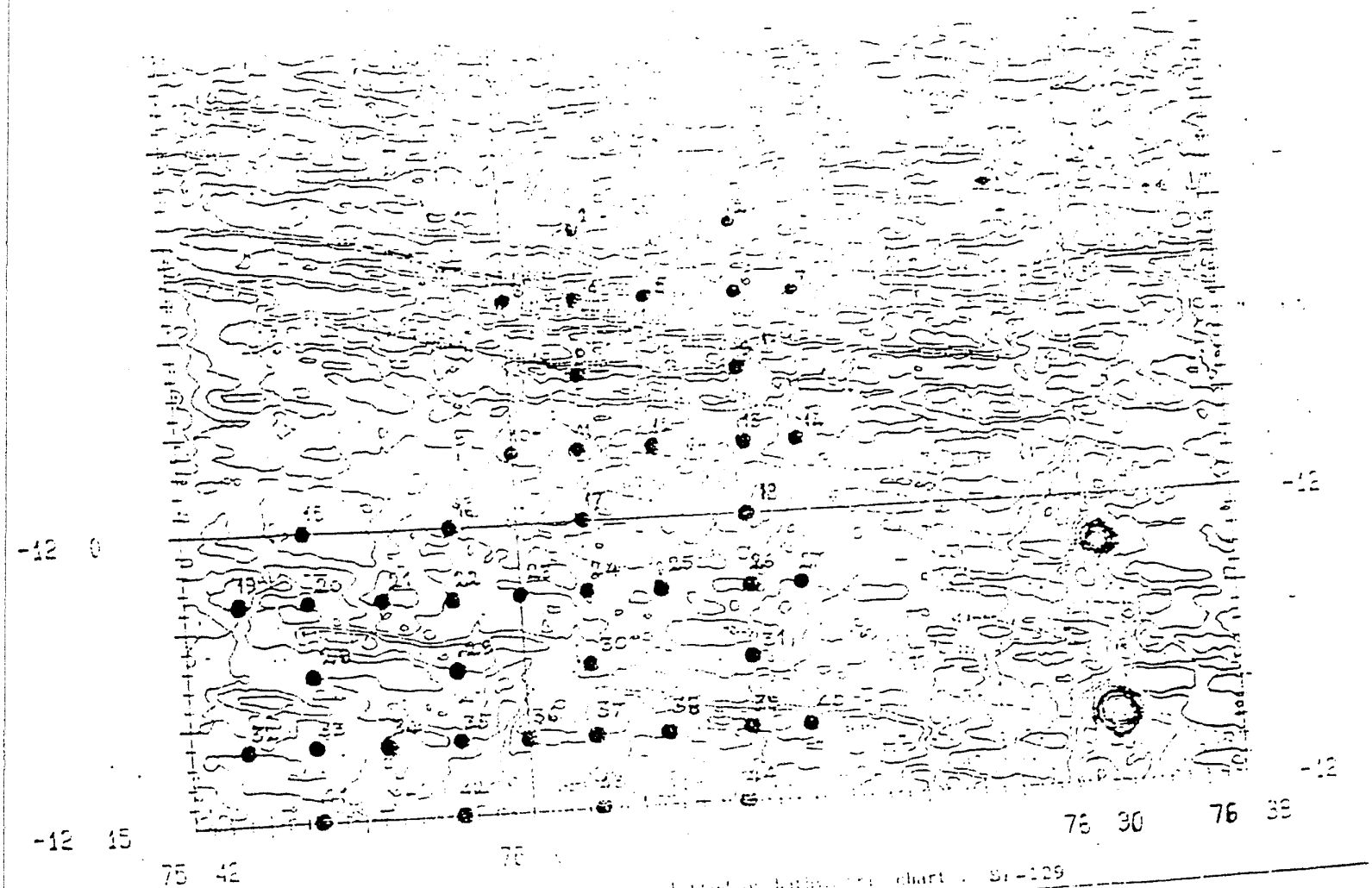

Figure 2. Station locations for PBS sampling plotted on bathymetric chart - St-129

Table 1: Details of manganese nodule sampling

Station	Water	Given location		Actual sample Location		Approx. offset
Abundance code (Kg/M^2)	depth(m)	Lat. (°S)	Long.(°E)	Lat. (°S)	Long.(°E)	(km)
VVG-01	5200	11°45.00'	76°03.75'	11°44.19'	76°00.00'	4
0.90						
VVG-02	5280	11°45.00'	76°11.25'	11°44.95'	76°09.15'	3
1.10						
VVG-07	5270	11°48.75'	76°15.00'	11°47.64'	76°09.37'	6
1.10						
VVG-06	5280	11°48.75'	76°11.25'	11°48.46'	76°09.34'	3
TRACE						
VVG-05	abondoned after failure of two operations.					
SPC-04	5350	11°48.75'	76°03.75'	11°48.11'	76°01.94'	3 8.0
SPC-03	5300	11°48.75'	76°00.00'	11°48.63'	75°57.95'	Rope damaged, equipment retreived after 12 hrs. 0.8

VVG- Van-Veen Grab; SPC- Spade Corer; Sample code Number same as given by the DOD.

Actual sample location is nothing but the position obtained on GPS when the equipment touched the seafloor.

Note the offset between the given location and actual sample location (>3 km) due to drift of the vessel during the operation. This offset is unavoidable.

Table 2: Location details of the sediment cores

Sample code	Water depth (m)	Location		Length of core (m)	Sediement type
		Latitude	Longitude		
SKCR-02	3800	3°00.91'N	76°29.65'E	5.8	Clay rich carbonate, severe dissolution features suggest deposition close to CCD.
SKCR-03	2800	4°59.50'N	76°27.50'E	5.5	Mostly carbonate ooze. Intact skeletal parts of forams indicate deposition above the lysocline.
SKCR-04	2000	6°29.67'N	75.58.68'E	5.2	as above
SKCR-05	2300	9°20.97'N	71°59.37'E	5.5	Clay rich carbonate, monotonous texture.

Table 3: Preliminary observations of the zooplankton samples

Station No.	Location		Remarks
	Latitude	Longitude	
ZP-01	0° 00' S	75° 10' E	Vertical: Calanoids like Rhinicalanus nasutus, R.cornutus abundant Surface: Oncaea renusta, O.media, Sapphirina nigromaculata.
ZP-02	5° 00' S	75° 30' E	Vertical: Copepods like Pleoromamma gracilis abundant. Surface: Chaetognaths like saggita bipunctata, S.hispida abundant.
ZP-03	10° 00' S	76° 00" E	Vertical: Amphipods like Lestrigonus schizogeneios abundant. Surface: Copepods like Candesia pachydactyla, pel. tunicates.
ZP-04	11°30' S	76°59' E	Vertical: Calanoids like Calanus sinicus, C.cristatus abundant. Surface: Pontellid copepods like Pontellopsis armata abundant.
ZP-05	10°00' S	78°14' E	Vertical: Copepods like Acartia clausi abundant. Surface: Copepods like Rhinocalanus rostrifrons, Acartia sps.
ZP-06	7°30' S	80°14' E	Vertical: Chaetognaths like Saggita robusta abundant. Surface: Pontellid copepods like Pontella securifer abundant.
ZP-07	5° 00' S	82° 09'E	Vertical: Siphonophores like Diphyes chamissonis abundant. Surface: Copepods like Oncaea media, Labidocera sp. abundant.
ZP-08	2°30' S	81°35' E	Vertical: Euphausiids, Coelenterates, Copepods abundant. Surface: Amphipodes like Lestrigonus schizogecios abundant.
ZP-09	0° 00'	80°09' E	Vertical: Amphipods like Phronima atlantica and copepods sp. Surface: Leptomedusae, Chaetognaths like Sagitta sps. abundant.
ZP-10	2°00' N	79°00' E	Vertical: Evadne sp., Copepods abundant. Surface: Amphipods like Themisto gracilipes abundant.
ZP-11	3° 02' N	76° 25'E	Vertical: Copepods like Scolecithrix danae abundant. Surface: Siphonophores and Leptomedusae sps. abundant.
ZP-12	5° 00' N	76° 30' E	Vertical: Copepods like Euchaeta sps, Calanus sinicus abundant. Surface: Pelagic insects like Halobates micans present.
ZP-13	6° 30' N	76° 00' E	Vertical: Pteropod like Finoloida desmarestii, Oithona sp. abundant Surface: Pelagic mollusk Atlantidae sp. abundant.
ZP-14	9° 20' N	71°58' E	Vertical: Few Copepodite stages and krills abundant. Surface: Pontellid copepods abundant.